REMARKS/ARGUMENTS

Claims 1-18 are pending. By this Amendment, claims 8, 11, 12, 14 and 16 are amended, and new claims 17 and 18 are presented. In view of the foregoing amendments and following remarks, reconsideration and allowance are respectfully requested.

Summary of Claim Amendments

Claim 8 is amended to further recite "wherein each of the at least two elongated members is a separate member separately supplied with high frequency power." Support for this amendment can be found, for example, in the 031 patent in FIGS. 8-10.

Claim 11 is amended to recite that "turns of the spiral antenna are arranged so that a pitch of the turns in a central region is greater than a pitch in an outer region." Support for this amendment can be found, for example, in the 031 patent in FIG. 7, and at column 9, lines 48 to 52.

Claim 12 is amended to replace the phrase "in a cured shape" with the phrase "in a curved shape." This amendment is made to correct an obvious typographical error.

Claim 12 is also amended to further recite "wherein each of the plurality of elongated members is a separate member separately supplied with high frequency power." Support for this amendment can be found, for example, in the 031 patent in FIGS. 8-10.

Claim 14 is amended to recite that "turns of the spiral antenna are arranged so that a pitch of the turns in a central region is greater than a pitch in an outer region." Support for this amendment can be found, for example, in the 031 patent in FIG. 7, and at column 9, lines 48 to 52.

Claim 16 is amended to replace the phrase "each of the elongated members has a flat elongated surface contracted with the surface" with the phrase "each of the elongated

members comprises a flat elongated surface that is in contact with the surface." This amendment is made to correct an obvious typographical error.

New claim 17 depends from claim 1 and further provides that the substantially planar spiral coil is a continuous coil. Support for new claim 17 can be found, for example, in the 031 patent in FIGS. 5-7.

New claim 18 depends from claim 1 and further provides that the substantially planar spiral coil comprises at least two elongated members that are separated in a radial direction. Support for new claim 18 can be found, for example, in the 031 patent in FIGS. 8 and 10.

Personal Interview

Applicants thank the Examiner for the courtesies extended to Applicants' representative during the April 18, 2008 Personal Interview. Applicants' separate record of the interview is incorporated into the following remarks.

Allowable Subject Matter

Applicants thank the Examiner for the indication in the Office Action that claim 7 contains allowable subject matter.

Rejection Under 35 U.S.C. §112, First Paragraph

The Office Action rejects claims 11, 12, 14 and 16 under the written description requirement of 35 U.S.C. §112, first paragraph. Applicants respectfully traverse the rejection.

With respect to claim 11, by this Amendment, claim 11 is amended to recite "turns of the spiral antenna are arranged so that a pitch of the turns in a central region is greater than a

pitch in an outer region." As agreed during the interview, such recitation is supported in the 031 patent, for example, in FIG. 7 and at column 9, lines 48 to 52.

With respect to claim 12, by this Amendment, claim 12 is amended to replace the phrase "in a cured shape" with the phrase "in a curved shape." Correction of this obvious typographical error obviates the rejection.

With respect to claim 14, by this Amendment, claim 14 is amended to recite "turns of the spiral antenna are arranged so that a pitch of the turns in a central region is greater than a pitch in an outer region." As agreed during the interview, such recitation is supported in the 031 patent, for example, in FIG. 7 and at column 9, lines 48 to 52.

With respect to claim 16, by this Amendment, claim 16 is amended to replace the phrase "each of the elongated members has a flat elongated surface contracted with the surface" with the phrase "each of the elongated members comprises a flat elongated surface that is in contact with the surface." Correction of this obvious typographical error obviates the rejection.

For the foregoing reasons, claims 11, 12, 14 and 16 are fully supported by the specification as filed. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

Rejection Under 35 U.S.C. §112, Second Paragraph

The Office Action rejects claim 12 as indefinite under 35 U.S.C. §112, second paragraph. Applicants respectfully traverse the rejection.

By this Amendment, claim 12 is amended to replace the phrase "in a cured shape" with the phrase "in a curved shape." Correction of this obvious typographical error obviates the rejection.

For the foregoing reasons, claims 12 is definite. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

Rejections Under 35 U.S.C. §103

A. Paranjpe

The Office Action rejects claims 1-6 and 12-16 under 35 U.S.C. §103(a) over U.S. Patent No. 5,231,334 to Paranjpe ("Paranjpe"). Applicants respectfully traverse the rejection.

1. Claim 1

Claim 1 recites "[a] method for processing a substrate with plasma, comprising the steps of: positioning the substrate in a processing chamber; supplying a high frequency power to a substantially planar spiral antenna from a central area thereof and generating an induced electric field in the processing chamber; generating a plasma in said processing chamber; and shaping said induced electric field with respect to said substrate so as to achieve a uniform distribution of said plasma on said substrate." (emphasis added). Paranjpe does not disclose or suggest such a method.

It is undisputed that Paranjpe fails to disclose supplying high frequency power to a substantially planar spiral antenna from a central area of the antenna. *See* Office Action, page 4. Applicants submit that Paranjpe also fails to suggest supplying high frequency power to a substantially planar spiral antenna from a central area of the antenna. In particular, Paranjpe fails to recognize two distinct advantages resulting from the above configuration and, thus, fails to provide disclosure sufficient to lead a skilled artisan to the method of claim 1. Supplying high frequency power to a central portion of a spiral antenna, as required by claim 1, provides structural advantages and permits a more uniform plasma distribution to be obtained. In a plasma processing apparatus including a spiral antenna, as recited in claim

1, there are chamber side walls located near the outer edge of the spiral antenna. Accordingly, it is difficult to provide insulation between the spiral antenna and the chamber side, if high frequency power is supplied to an outer portion of the antenna. By contrast, when high frequency power is supplied to the central portion of the spiral antenna, it is easy to secure insulation between the spiral antenna and the chamber side walls. Thus, the configuration recited in claim 1 provides a distinct advantage from a structural standpoint.

Also, at the location of the spiral antenna where high frequency power is applied (power feeding point), the voltage becomes high. As a result, in the region below the power feeding point, capacitance coupling occurs between the high voltage and the plasma. That is, it is believed that RF energy is transmitted to the plasma by the capacitance coupling, in addition to the RF energy transmitted to the plasma by the induction field.

Generally, plasma density in the vicinity of the central portion of a spiral antenna tends to be low because the induction filed is weak. However, when high frequency power is supplied to the central portion of the spiral antenna, capacitance coupling occurs between the high voltage at the power feeding point in the central portion of the antenna and the plasma. This additional transmission of RF energy has the effect of suppressing the tendency for low plasma density in the vicinity of the central region of the spiral antenna. In comparison with a configuration where high frequency power is supplied to the outer portion of the spiral antenna, supplying to the central portion is believed to result in a more uniform plasma density. Particularly, where high frequency power is supplied to the outer portion of the spiral antenna, capacitance coupling occurs in the region below the application point of the high frequency voltage, resulting in a bias in plasma density distribution to the location where high frequency power is supplied. *See, e.g.,* FIGS. 1-3 (attached hereto).

Paranjpe does not disclose the configuration of claim 1, or recognize the benefits stemming therefrom. As Paranjpe fails to disclose or suggest supplying high frequency

power to a substantially planar spiral antenna from a central area of the antenna, Paranjpe fails to disclose or suggest each and every feature of claim 1.

2. Claim 12

Claim 12 recites "[a] method for processing a substrate by a plasma processing apparatus, comprising positioning the substrate ... applying a high frequency power ... generating a plasma ... wherein each of the plurality of elongated members is a separate member separately supplied with high frequency power" (emphasis added). Paranjpe and Ogle do not disclose or suggest such a method.

As agreed during the interview, Paranjpe does not disclose employing an apparatus in which a spiral antenna includes separate elongated members separately supplied with high frequency power. Rather, Paranjpe discloses a configuration in which a series of coil segments are together supplied with high frequency power. *See, e.g.,* Paranjpe, FIG. 2.

Accordingly, the combination of references fails to disclose or suggest each and every feature of claim 12.

* * * *

As explained, claims 1 and 12 would not have been rendered obvious by Paranjpe. Claims 2-6 and 13-16 depend variously from claims 1 and 12 and, thus, also would not have been rendered obvious by Paranjpe. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

B. Paranjpe and Ogle

The Office Action rejects claims 8-11 under 35 U.S.C. §103(a) over Paranjpe in view of U.S. Patent No. 4,948,458 to Ogle ("Ogle"). Applicants respectfully traverse the rejection.

Claim 8 recites "[a] method for processing a substrate by a plasma processing apparatus including ... a spiral antenna having at least two elongated members ... the method comprising: supporting the substrate ... introducing a processing gas ... supplying a high frequency power ... generating a plasma ... wherein each of the at least two elongated members is a separate member separately supplied with high frequency power" (emphasis added). Paranjpe and Ogle do not disclose or suggest such a method.

As agreed during the interview, Paranjpe does not disclose employing an apparatus in which a spiral antenna includes separate elongated members separately supplied with high frequency power. Rather, Paranjpe discloses a configuration in which a series of coil segments are together supplied with high frequency power. *See, e.g.*, Paranjpe, FIG. 2.

Ogle does not remedy the deficiencies of Paranjpe. Ogle is cited for its alleged disclosure of placing a wafer on a support surface. *See* Office Action, pages 5 to 6. However, Ogle, like Paranjpe, fails to disclose or suggest employing an apparatus in which a spiral antenna includes separate elongated members separately supplied with high frequency power. Accordingly, the combination of references fails to disclose or suggest each and every feature of claim 8.

As explained, claim 8 would not have been rendered obvious by Paranjpe and Ogle. Claims 9-11 depend from claim 8 and, thus, also would not have been rendered obvious by Paranjpe and Ogle. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

New Claims

By this Amendment, new claims 17 and 18 are presented. New claims 17 and 18 depend from claim 1 and, thus, are believed to be patentable over the cited references for at least the reasons discussed above with respect to claim 1.

Conclusion

For the foregoing reasons, Applicants submit that claims 1-16 are in condition for allowance. Prompt reconsideration and allowance are respectfully requested.

Respectfully submitted,

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Attachments:
FIGS. 1-3